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ABSTRACT

This article discusses some current developments in Computer Based Guidance (CBG). CBG includes two major domains: educational/vocational information systems and counselor training programs. Educational/vocational information systems provide comprehensive and up-to-date data bases of information on educational requirements or programs and occupational opportunities. Counselor training programs include computer assisted instruction and simulation models of client or counselor behavior. It is argued that CBG will increase the effectiveness and sophistication of guidance and counseling practices. (Author)

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RIR-77-3

Computer Based Guidance: The Shape of Things to Come.

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."

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ABSTRACT

This article discusses some current developments in Computer Based Guidance (CBG). CBG includes two major domains: educational/vocational information systems and counselor training programs. Educational/vocational information systems provide comprehensive and up-to-date data bases of information on educational requirements or programs and occupational opportunities. Counselor training programs include computer assisted instruction and simulation models of client or counselor behavior. It is argued that Computer Based Guidance will increase the effectiveness and sophistication of guidance and counseling practices.

Today, almost all complex human activities rely heavily upon sophisticated tools or technology. For example, it is hard to imagine the practice of medicine without the aid of elaborate equipment and tools. Even the general practitioner depends upon the use of simple tools such as the stethoscope or ophthalmoscope. Such tools extend human sensory or motor abilities beyond their natural range.

Similarly, computers are now widely used to extend our intellectual abilities -- calculation, reasoning, categorization, planning and decision-making. For example, the use of simulation models of different types of systems (e.g., transportation, communication, educational) has permitted a greater understanding of how the components of such computer systems interact and, also, has allowed more accurate prediction of future outcomes and consequences of certain decisions and policies.

The application of computers to the areas of guidance and counseling is an attempt to augment and extend human capability to guide and counsel. Thus, the aims of Computer Based Guidance (CBG) involve the traditional ones (e.g., helping individuals match their interests and abilities with appropriate careers and lifestyles; providing the right information to the right person at the right time, and so on), however, the means used to achieve these goals are more sophisticated.

What is meant by more sophisticated means? This

includes:

*more comprehensive, accurate, and up-to-date information on educational-vocational opportunities

*more extensive and effective use of an individual's personal history

*immediate and wider availability of guidance services

*more alternatives with respect to counseling strategies and orientations

*explication and elaboration of the processes involved in counseling

*more effective methods and procedures for counselor training

The above list is not a list of promises but rather a description of some of the contemporary achievements in the field of Computer Based Guidance (CBG). The purpose of this article is to discuss some of the features of these achievements, as well as problems and prospects. In particular, we shall discuss two major domains of CBG; educational - vocational information systems and computer based counselor training. These two separate areas have been selected for discussion in order to illustrate the scope or range of CBG activity. We will begin with the area of educational / vocational information systems.

EDUCATIONAL - VOCATIONAL INFORMATION SYSTEMS

Today's high school or college student is faced with an enormous number and range of educational and occupational

alternatives. The sheer volume of information available makes it very difficult for the counselor to provide accurate information and for the student to make appropriate choices. Educational - vocational information systems are intended to help both counselor and student cope with this information overload.

The effectiveness of an educational - vocational information system is a joint function of at least three major factors:

*the accuracy and completeness of the information data base

*the availability and ease of use of the system

*the degree to which it is personally relevant to the individual seeking information

The first factor is a function of the size of the data base, its quality, and its recency. Because of the large storage capacity of most computer systems, their "perfect" recall ability, and the capability for almost instantaneous revision, the accuracy and completeness is usually quite impressive. Computerized information systems can be made available via a computer terminal at virtually any location by telephone or satellite and usually for extended hours of service. The ease of use of such systems depends upon how well they have been designed and how well different modes of use have been anticipated.

The last factor, personal relevance, depends upon the

amount and type of information available to the system about the individual and how it is used. There is also the matter of the local relevance of the information in the data base. Thus, information about apprenticeship training in one part of the country may not apply to to another region. This means that at least some of the information in data bases should probably be compiled locally rather than centrally (see Romaniuk & Souch, 1976).

A comprehensive review of some current computer-based vocational counseling systems was reported by Bowlsbey (1975). During the last ten years approximately 30 major computer-based counseling systems have been developed and implemented (in addition to many small projects at universities, colleges and high schools). However, only about seven of the original 30 systems are still operational. The systems that have been successful and remained are those that permit users to access the system via on-line terminals.[1] Harris (1974) described these systems as "direct" inquiry systems. Much of the reason for the success of the on-line systems is the interactive nature of the counseling sessions. The sessions are interactive in the sense that the computing system responds immediately to the user's request or input. By interacting with the

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1. The term "on-line" refers to the fact that the computer processes input and responds essentially immediately. This is contrasted with "batch" processing in which input is run as a "job" (usually in card format) and response may take several hours or days.

computer, the user can change various choices and see the effects of these changes.

Of the seven major counseling systems described by Bowlsbey (1975), the three most widely used systems are the Guidance Information System (GIS), the Computerized Vocational Information System (CVIS) and the System of Interactive Guidance and Information (SIGI). The CVIS and GIS systems are primarily designed for use by secondary school students while the SIGI system is mainly intended for college students.

The GIS system evolved from the Information System for Vocational Decisions project conducted at Harvard under the direction of D.V. Tiedeman. GIS is now available at more than 1400 centers in 26 states. It provides information on over 1200 occupations and 2600 colleges, universities and technical institutes. In addition, administrative and instructional programs are available with GIS.

GIS is commercially marketed by the Time Share Corporation. The system is available in three ways: it can be used on a time-sharing basis via telephone lines from a central computer, the system can be leased to run on a suitable computer, or the system can be purchased along with a mini-computer system which will service from 8 to 32 users simultaneously. This provides a range of alternatives for those interested in using the GIS system.

CVIS was developed by the guidance staff at Willowbrook High School in Villa Park, Illinois, and personnel from the data processing department at Du Page College, Glen Ellyn, Illinois. The system provides information about 400 specific occupations and 1600 colleges. In addition, students can request information about local community colleges. technical schools, apprenticeship requirements, local companies which offer apprenticeship opportunities, and a list of jobs available at local companies. CVIS can also be used for administrative and instructional applications. For example, the counselor can sit at an on-line terminal to check and update student records, recall and change student schedules, and register students.

In the time since CVIS was first implemented, a number of educational institutions have used the original or modified versions of the system. The various versions run primarily on large scale computers such as IBM 360/370 systems.

During the past few years the CVIS users have met informally on an annual basis. In 1975, the users group incorporated the "CVIS Consortium" as a non-profit organization. This group consists of over 270 sites in 19 states. Institutions wishing to purchase one of the seven versions of CVIS may do so from the CVIS Consortium (Rabus, 1976).

SIGI was developed for students in, or about to enter,

a two-year or four-year college. The system was developed by Educational Testing Service (ETS) of Princeton, New Jersey. Emphasis in SIGI is placed upon aiding students to make informed and rational career decisions based upon a collection of 155 occupations. SIGI permits students to clarify their values, provides information about occupations based upon the student's personal values and predicts the student's probable success in a training program which leads to an occupational choice. The student is permitted to explore options, and formulate and revise career choices. The system has been field tested and is being demonstrated in five community colleges across the United States. Preliminary evaluation data indicates that SIGI is highly rated by both counselors and students. The system operates solely on PDP-11 computers, manufactured by Digital Equipment Corporation (DEC). The PDP-11 computers are small computer systems designed to service a relatively small number of local users. SIGI is available on a three year lease from ETS. The cost of the lease is dependent upon the size of the college enrollment; the larger the enrollment, the higher the cost of the lease.

Insert Table 1 here

Table 1 provides a comparison of some essential features of CVIS, GIS, and SIGI. All three systems provide users with accurate and up-to-date information about

occupations. In addition, CVIS and GIS provide information about college programs and requirements. If local information about educational institutions is desired, this must be done by the local group that implements CVIS, by Time Share Corporation for GIS, or through ETS in the case of SIGI. With the advent of national computer communication networks (e.g., EDUCOM), the sharing of local information about institutions and vocational opportunities will be possible.

Developments in the field of information retrieval are particularly germaine to this domain of CBG. The quality of guidance available depends upon the adequacy of the data base. Large data bases present problems in terms of central processing and storage costs, response time, and maintenance efforts (e.g., updating). Recent developments and trends in computer hardware, particularly the ultilization of microprocessors, the sharing of data and programs via data networks, and advances in information retrieval technology (e.g., parallel searched, content addressed or associative memory) will likely substantially reduce these problems. Thus in the near future, large data bases will be quickly accessed at a negligible cost.

COMPUTER BASED COUNSELOR TRAINING

The second broad area of CBG to be discussed is computer based counselor training programs. Counselor training involves a number of major facets: formal exposure of the counselor to different views of personality and different orientations to counseling, an understanding of the counseling process, and practical experience with clients. In this section we consider how each of these aspects of counslor training can be extended through the use of computers.

Computer Assisted Instruction

One of the most direct ways in which the computer can be used in counselor training is Computer Assisted Instruction (CAI). In this section, we describe a CAI program called ROGER specifically designed to teach the theory of personality and therapy of Carl Rogers to counseling students at the University of Alberta. [2]

ROGER consists of two instructional segments. The first segment covers Rogerian personality theory and includes the following major topics:

*Assumptions about man

*Phenomenal field

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2. This program was written in COURSEWRITER II and implemented on the IBM 1500 instructional system. For details of the system, see Hunka & Romaniuk (1974).

*The self

*Positive regard

*Actualization / self-actualization

*Psychological adjustment

*Psychological maladjustment

The second instructional segment introduces client centered therapy and covers the following major topics:

*General overview of client-centered therapy

*Conditions of the therapeutic process

*Role of the therapist

*Therapy as experienced by the client

*Outcomes in personality & behavior

Some of the design features involved in the course are continual student feedback, learner control over the sequence of topics, the liberal use of humor, and personalization (achieved by using the student's first name throughout the course).

In addition to teaching the details of Rogerian theory, a second major purpose of the course was to assess the personal orientation of the students in relation to the Rogerian approach to therapy. Students were asked to indicate the extent to which they agreed with a Rogerian approach and to what degree they planned to emphasize the client-centered approach in their own counseling. This information was then used as a basis for individual feedback for each student so that he/she could begin to formulate his/her own personal theoretical and counseling

orientations.

The program automatically recorded individual performance during the course. This includes the number of questions answered correctly, incorrectly, and the amount of time spent on each topic. Because the program allowed students to control the sequence of instruction themselves, students had the option to bypass or review topics. Records were kept of the amount of study completed by each student. As well, the program kept track of the number of times that a student branched to the table of contents, to a glossary to look up a term, and whether reviews involved an entire topic or just the previously presented screen display. All of these performance records were then available for use in providing student feedback, for research purposes, or discussion sessions between counselor trainer and the student trainee.

Although ROGER is still in an early stage of development, the results of a formative evaluation are available from an initial group of 43 student counselors who have completed the course. The mean completion time for the course was 110 minutes. The individual times ranged between 50 and 250 minutes. This range in completion time of approximately 3 hours reflected the individual differences in the rate of learning by different students. The results of the student evaluations, given in Table 2, indicate that the course was considered to be effective and was rated

highly.

Insert Table 2 here.

In terms of overall performance, 77% of the questions on the course content were answered correctly on the first attempt suggesting that the students grasped the content reasonably well.

However, perhaps a more valuable learning experience for the student resulted from the program's use of personalized individual feedback messages. The feedback messages were expressed in terms of the student's Rogerian orientation. After the presentation of a major Rogerian concept or principle, students were asked to indicate

(a) the extent to which they agreed with this idea

(b) the degree to which they planned to use the principle

For the 43 students who completed the course, the overall group agreement with the Rogerian approach, across all questions, was 78.7 %. The overall indicated tendency to use a Rogerian approach in therapy was 80.0% for all students and questions. The students' Rogerian orientation approximated a normal distribution for both measures. These results suggest that by using the program over a period of years with a large number of students, it would be feasible to establish norms for a Rogerian orientation among counselor trainees. Such norms would be useful in providing

feedback to student counselors in terms of their "Rogerian" orientation to therapy . Even without norms, the present program seems to be beneficial in allowing students to begin to establish their own theoretical rationalization and orientation in relation to that of Rogers.

Use of the course ROGER has demonstrated that CAI can be useful in counselor education. It allows the counselor educator to focus on the practicum aspect of counselor training, leaving the computer to provide individualized instruction to the student on the theoretical components of counseling. In addition to its potential for effective instruction, CAI is also a powerful medium for increasing the amount of feedback to the student. As such, it needs to be further investigated and evaluated in terms of the implications for counselor training. Because every counselor must operate from some theoretical basis, effective instruction in theories of personality and therapy are an essential part of counselor training (Lester, 1964; Penny, 1971).

If programs such as ROGER were available for each major theoretical and therapy orientation in counseling, a student could achieve an adequate understanding of each major orientation and discover, via individualized feedback, the extent to which each approach is personally relevant. Not only could such information be used for individual evaluation, but it would also be useful for the study of the

characteristics of counselor trainees or perhaps even the design of expectancy tables to predict future counseling preference or success from student profiles. Thus, CAI counseling programs would not only be of immediate benefit to individual students but also could contribute to a more sophisticated data base to be used in the prediction of counselor behavior. ROGER, then, is only the beginning step in a very important area of counselor training.

Client & Counselor Simulations.

In typical counselor training, practical experience with clients comes only after students have finished their formal training and begun work in the field. It is possible using client simulation models to provide counselors with some practical experience as part of their formal training. The value of such training should be evident; the counselor can explore the effectiveness of different counseling strategies with the same client and observe their relative effectiveness. It is also possible to sensitize the counselor to the strengths and weaknesses of different counseling methods for certain types of problems and individual differences. Of course the effectiveness of client simulations depends upon the validity of the simulation model in depicting the essential personality attributes of clients. On theoretical grounds, simulation models have considerable potential for modelling individuals in terms of differences in conceptual structures and rule

systems (see Kearsley, 1976).

To illustrate the nature of client simulation models, the features of the CLIENT1 model (Hummel, Lichtenberg & Shaffer, 1975) are described below. CLIENT1 simulated the behavior of a particular client (male, aged 30, married with children) in an initial counseling interview. This "client" had a finite number of topics which he could discuss and each topic had different degrees of importance and affective significance.

To use CLIENT1, the human counselor sits at a terminal and conducts the interview by typing in questions and responses to the program. As the simulated client and counselor interact, they may or may not progress towards a statement of the client's problem depending upon certain counselor variables. These variables include measures of the accuracy and appropriateness of the counselor's questions and remarks, the degree of threat elicited, and the particular topics discussed. The success or failure of the counselor on these variables will cause the simulated client to become more general or specific in his statements, to become "defensive", change the topic, or terminate the interview.

CLIENT1 embodies a certain view of successful counseling and hence the success of the counselor with the client will depend upon the degree to which this orientation is used. As Meany (1972) has remarked:

> The initial theory used in the design of a computer-based counselor training system has an important influence on the final system. Carl Rogers and B.F. Skinner would probably design very dissimilar counselor training systems. (p. 115)

It is the task of the counselor trainee to discover which orientation is successful with this particular simulated client and then use it. It would be possible to construct other simulated clients with different personalities, backgrounds, or problems which require different therapy approaches to be successfully counseled. Each of these simulated clients would provide a "replicable" case study for all students. A "library" of such simulated clients would be extremely valuable for research and training purposes.

Instead of simulating the client, an alternative approach is to simulate the counselor. The purpose of this type of simulation is to theorize about and demonstrate the decision processes thought to be used in the counseling process. It is hoped that such theorizing will result in a better understanding of the decision-making, tactics and strategies used in counseling. Again, we would expect different models to arise from different orientations to counseling.

There are two different approaches which can be followed in the design of a counselor simulation model. The

first design involves an abstract analysis of the decision processes involved in counseling and attempting to construct a model on this basis. Ellis & Tiedeman (1970) discuss some of the processes and stages which might be involved in general counseling activity. If these processes and stages could be specified precisely enough, they could be programed and a simulation model of an "idealized" counselor would result.

The second approach (which might be called case-descriptive) involves the construction of a simulation model based upon the detailed study of a particular counselor. This approach was followed by Romaniuk & Maguire (1970) in an educational guidance context. A high school counselor was presented with five hypothetical students and asked to think aloud as he interpreted and analyzed their high school records and planned a program for each student. The counselor's verbalizations were tape-recorded and a flow-chart decision model was fomulated from the analysis of the protocols. This flowchart model formed the basis for a computer model of the counseling process.

Either of these two approaches to the construction of counselor simulation models leads to essentially the same outcome -- an explicit model of the decision processes involved in counseling behavior. While such models are likely to be most valuable for the increased understanding of counseling that they provide, they could also be very

useful in counselor training. Having a number of simulated counselors, each one representing a particular counseling orientation, would allow students to determine for themselves the characteristics and inherent limitations of each approach from the point of view of a client. Thus, client and counselor simulation models would provide the student trainee with both perspectives of the client-counselor interaction.

Work on client and counselor simulation models closely relates to various lines of research in contemporary cognitive psychology and the field of artificial intelligence. This includes the simulation of cognitive processes (e.g., problem solving, concept formation, reasoning) and work on natural language understanding systems. For recent surveys of this research see Gregg (1974) or Schank & Colby (1973). In fact, the eventual success of this area of CBG is closely linked to progress in these two areas of psychology and computer science.

CONCLUSIONS

In the preceding discussion, two diverse areas of CBG have been outlined: educational / vocational information systems, and computer based counselor training programs. These two areas serve to illustrate the type of sophistication which the computer can bring to certain aspects of guidance and counseling activities.

Ellis and Tiedeman (1970) posed the question: "Can a machine counsel?" and answered in the affirmative. However, their purpose in posing this question was to emphasize the instrumental role of the computer -- its value in demonstrating that counseling objectives can be defined and that counseling processes can be made explicit enough to be programmed for a computer. In terms of user acceptance, effectiveness and cost feasibility, the answer to this question is certainly affirmative (see Harris, 1974; Price, 1974).

We would like to suggest a stronger form of the question posed by Ellis & Tiedeman, namely: "Can a computer counsel better than a human?". Our answer is "no" -- on logical grounds. Computer counseling is an extension of human counseling capability and hence it makes no sense to view them as antagonists. Educational - vocational information systems require considerable (human) skill in their organization and implementation if they are to be effective guidance tools. The counselor must still provide guidance on personal, social or academic problems. The quality of counselor training programs (whether computer assisted instruction or computer simulation) depends upon the quality of the designer's knowledge and experience. Thus it is wrong to pit computer against human counseling. Computer counseling is simply an extension of human counseling.

Computer based guidance has the practical and research potential to elevate current guidance and counseling practices from an art form to a sophisticated and effective technology. Furthermore, CBG will likely be an essential component of the sophisticated computer based educational systems which are probably not too far off. This includes the integration of CBG with computer based instruction (CBI), computer managed instruction (CMI) and computer based testing (CBT). In fact an integrated, computer based educational system is almost a necessity if our educational system is to stay in touch with the technological sophistication of today's children and society in general. Active involvement in CBG is necessary now, if the field of guidance and counseling is to keep up with such changes.

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TABLE 1

Comparison of CVIS, GIS and SIGI.

	CVIS	GIS	SIGI
Student Group	high school	high school	college
System Cost	purchase $900-1000	lease --	lease $5000-13000
Operating Costs	depends upon particular computer	less than $1 per terminal hour	$2-$4 per terminal hour
Type of Computer	IBM 360/370 (shared)	TSC 200/300 minicomputer (dedicated)	DEC PDP-11 minicomputer (dedicated)
Present Usage	in use at 7 major institutions	available at 1400 sites	field testing at 6 major institutions

TABLE 2

Student Attitudes Towards ROGER.

Question	Mean Student Rating (Maximum=4)
1. How would you rate CAI as an educational tool?	3.19
2. How would you rate the manner in which the material in this course was presented?	3.14
3. How well do you feel that you know Rogerian personality theory and client-centered therapy?	2.56
4. Would you say that taking this course has benefited you?	3.14
5. Would you advise other counseling students to take this course.	3.40